I claim:

1. A system for reducing harmonics in a circuit, the circuit being powered by a main three phase power source having a main three phase voltage set, each main phase voltage having a main voltage amplitude and a main voltage phase, the system comprising:

main rectifier means;

auxiliary rectifier means connected to the main rectifier means; and

an autotransformer connected to the main rectifier means and the auxiliary rectifier means, the autotransformer adapted to generate a set of auxiliary voltages, each auxiliary voltage having an auxiliary voltage amplitude and phase, the auxiliary voltage amplitude ranging between .70 and .75 times the main voltage amplitude, and the auxiliary voltage phase ranging between 55 and 65 degrees out of phase with the main voltage phase, whereby twelve pulse rectification is achieved.

2. The system of claim 1, wherein the autotransformer comprises:

a plurality of primary windings connected in a delta configuration; and

a plurality of secondary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding.

3. The system of claim 2, wherein the plurality of primary windings comprises a first primary winding, a second primary winding and a third primary winding, and the plurality of secondary windings comprises a first secondary winding, a second secondary winding and a third secondary winding, and wherein the first secondary winding is electrically connected to the first primary winding and magnetically coupled to the third primary winding, the second secondary

winding is electrically connected to the second primary winding and magnetically coupled to the first primary winding, and the third secondary winding is electrically connected to the third primary winding and magnetically coupled to the second primary winding.

4. The system of claim 1, further comprising a main choke connected between the autotransformer and the main rectifier means and an auxiliary choke connected between the autotransformer and the auxiliary rectifier means.

5. The system of claim 1, further comprising a choke connected between the power source and the autotransformer.

6. The system of claim 2, wherein the main rectifier means and the auxiliary rectifier means are three phase diode bridges, each having ac input means and dc output means such that the ac input means of the main diode bridge is connected to the main power source via the primary windings of the autotransformer, the ac input means of the auxiliary diode bridge is connected to the secondary windings of the autotransformer, and the dc output means of the main diode bridge and the auxiliary diode bridge are connected in parallel.

7. The system of claim 1, wherein the main rectifier means has a main rectifier power and the auxiliary rectifier means has an auxiliary rectifier power such that the main rectifier power and the auxiliary rectifier power are not substantially equal.

8. The system of claim 1, wherein the system is adapted to connect to a load having a load power, and wherein the main rectifier power is at least seventy-five percent of the load power.

9. A system for reducing harmonics in a circuit, the circuit being powered by a main three phase power source having a main three phase voltage set, each main phase voltage having a main voltage amplitude and a main voltage phase, the system comprising:

main rectifier means;

first auxiliary rectifier means connected to the main rectifier means;

second auxiliary rectifier means connected to the main rectifier means and the first auxiliary rectifier means; and

an autotransformer connected to the main rectifier means, the first auxiliary rectifier means, and the second auxiliary rectifier means, the autotransformer adapted to generate a first and second set of auxiliary voltages, each first set of auxiliary voltages having a first auxiliary voltage amplitude and a first auxiliary voltage phase and each second set of auxiliary voltages having a second auxiliary voltage amplitude and a second auxiliary voltage phase, the first and second auxiliary voltage amplitude ranging between .73 and .78 times the main voltage amplitude, and the first auxiliary voltage phase ranging between 35 and 40 degrees leading with respect to the main voltage phase, and the second auxiliary voltage phase being between 35 and 40 degrees lagging with respect to the main voltage phase, whereby eighteen pulse rectification is achieved.

10. The system of claim 9, wherein the autotransformer comprises:

a plurality of primary windings connected in a delta configuration; and

a plurality of secondary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding.

11. The system of claim 10, wherein the plurality of primary windings comprises a first primary winding, a second primary winding and a third primary winding, and the plurality of secondary windings comprises a first secondary winding, a second secondary winding, a third secondary winding, a fourth secondary winding, a fifth secondary winding and a sixth secondary winding, and wherein the first secondary winding is electrically connected to the first primary winding and magnetically coupled to the third primary winding, the second secondary winding is electrically connected to the second primary winding and magnetically coupled to the first primary winding, the third secondary winding is electrically connected to the third primary winding and magnetically coupled to the second primary winding, the fourth secondary winding is electrically connected to the first primary winding and magnetically coupled to the second primary winding, the fifth secondary winding is electrically connected to the second primary winding and magnetically coupled to the third primary winding, and the sixth secondary winding is electrically connected to the third primary winding and magnetically coupled to the first primary winding.

12. The system of claim 9, further comprising a main choke connected between the autotransformer and the main rectifier means, a first auxiliary choke connected between the autotransformer and the first auxiliary rectifier means, and a second auxiliary choke connected between the autotransformer and the second auxiliary rectifier means.

13. The system of claim 9, further comprising a choke connected between the power source and the autotransformer.

14. The system of claim 9, wherein the main rectifier means, the first auxiliary rectifier means and the second auxiliary rectifier are three phase diode bridges, each having ac input means and dc output means such that the ac input means of the main rectifier means is connected to the main power source via the primary windings of the autotransformer, the ac input means of the first auxiliary rectifier means is connected to the first, second and third secondary windings of the autotransformer, the ac input means of the second auxiliary rectifier means is connected to the fourth, fifth and sixth secondary windings of the autotransformer, and the dc output means of the main diode bridge, the first auxiliary diode bridge, and the second auxiliary diode bridge are connected in parallel.

15. The system of claim 9, wherein the main rectifier means has a main rectifier power, the first auxiliary rectifier means has a first auxiliary rectifier power, and the second auxiliary rectifier means has a second auxiliary rectifier power such that the main rectifier means power is not substantially equal to either the first or second auxiliary rectifier means power.

16. The system of claim 15, wherein the system is adapted to connect to a load having a load power, and wherein the main rectifier power is at least 66 percent of the load power.

17. The system of claim 16, wherein the remainder of the load power is shared substantially equally between the first auxiliary rectifier means and the second auxiliary rectifier means.

18. A system for reducing harmonics in a circuit, comprising:

main rectifier means having a main rectifier means power;

auxiliary rectifier means having an auxiliary rectifier power and connected to the main rectifier means; and

an autotransformer connected to the main rectifier means and the auxiliary rectifier means, the autotransformer being adapted to generate a set of auxiliary voltages such that the main rectifier power is not substantially equal to the auxiliary rectifier power.

19. A system for reducing harmonics in a circuit, comprising:

main rectifier means having a main rectifier means power;

first auxiliary rectifier means having a first auxiliary rectifier power and connected to the main rectifier means;

second auxiliary rectifier means having a second auxiliary rectifier power and connected to the main rectifier means and the first auxiliary rectifier means; and

an autotransformer connected to the main rectifier means, the first auxiliary rectifier means, and the second auxiliary rectifier means, the autotransformer being adapted to generate a set of auxiliary voltages such that the main rectifier power is not substantially equal to either the first or second auxiliary rectifier power.

20. An autotransformer for use in reducing harmonics in a circuit having a main three phase voltage set, each main phase voltage having a main voltage amplitude and a main voltage phase, the autotransformer comprising:

a plurality of primary windings connected in a delta configuration; and

a plurality of secondary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding, whereby a set of auxiliary voltages is generated, each auxiliary voltage having an auxiliary voltage amplitude and phase, the auxiliary voltage amplitude ranging between .70 and .75 times the main voltage amplitude, and the auxiliary voltage phase being between 55 and 65 degrees out of phase with the main voltage phase.

21. The autotransformer of claim 20, wherein the plurality of primary windings comprise a first primary winding, a second primary winding and a third primary winding, and the plurality of secondary windings comprise a first secondary winding, a second secondary winding and a third secondary winding, and wherein the first secondary winding is electrically connected to the first primary winding and magnetically coupled to the third primary winding, the second secondary winding is electrically connected to the second primary winding and magnetically coupled to the first primary winding, and the third secondary winding is electrically connected to the third primary winding and magnetically coupled to the second primary winding.

22. An autotransformer for use in reducing harmonics in a circuit having a main three phase voltage set, each main phase voltage having a main voltage amplitude and a main voltage phase, the autotransformer comprising:

a plurality of primary windings connected in a delta configuration; and

a plurality of secondary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding,

whereby a first and second set of auxiliary voltages is generated, each first set of auxiliary voltages having a first auxiliary voltage amplitude and a first auxiliary voltage phase and each second set of auxiliary voltages having a second auxiliary voltage amplitude and a second auxiliary voltage phase, the first and second auxiliary voltage amplitudes ranging between .73 and .78 times the main voltage amplitude, the first auxiliary voltage phase ranging between 35 and 40 degrees leading with respect to the main voltage phase, and the second auxiliary voltage phase ranging between 35 to 40 degrees lagging with respect to the main voltage phase.

23. The autotransformer of claim 22, wherein the plurality of primary windings comprise a first primary winding, a second primary winding and a third primary winding, and the plurality of secondary windings comprise a first secondary winding, a second secondary winding, a third secondary winding, a fourth secondary winding, a fifth secondary winding and a sixth secondary winding, and wherein the first secondary winding is electrically connected to the first primary winding and magnetically coupled to the third primary winding, the second secondary winding is electrically connected to the second primary winding and magnetically coupled to the first primary winding, the third secondary winding is electrically connected to the third primary winding and magnetically coupled to the second primary winding, the fourth secondary winding is electrically connected to the first primary winding and magnetically coupled to the second primary winding, the fifth secondary winding is electrically connected to the second primary winding and magnetically coupled to the third primary winding, and the sixth secondary winding is electrically connected to the third primary winding and magnetically coupled to the first primary winding.

24. A method of reducing harmonics in a circuit, the circuit being powered by a main three phase power source having a main three phase voltage set, each main phase voltage having a main voltage amplitude and a main voltage phase, the method comprising:

connecting a plurality of primary windings in a delta configuration; and

connecting a plurality of secondary windings to the plurality of primary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding such that the autotransformer generates a set of auxiliary voltages, each auxiliary voltage having an auxiliary voltage amplitude and phase, the auxiliary voltage amplitude ranging between .70 and .75 times the main voltage amplitude, and the auxiliary voltage phase ranging between 55 and 65 degrees out of phase with the main voltage phase

25. The method of claim 24, wherein the plurality of primary windings comprises a first primary winding, a second primary winding and a third primary winding, and the plurality of secondary windings comprises a first secondary winding, a second secondary winding and a third secondary winding, and wherein the step of connecting the plurality of primary windings to the secondary windings further comprises:

electrically connecting the first secondary winding to the first primary winding;

magnetically coupling the first secondary winding to the third primary winding;

electrically connecting the second secondary winding to the second primary winding;

magnetically coupling the second secondary winding to the first primary winding;

electrically connecting the third secondary winding to the third primary winding; and

magnetically coupling the third secondary winding to the second primary winding.

26. A method of reducing harmonics in a circuit, the circuit being powered by a main three phase power source having a main three phase voltage set, each main phase voltage having a main voltage amplitude and a main voltage phase, the method comprising:

connecting a plurality of primary windings in a delta configuration; and

connecting a plurality of secondary windings to the plurality of primary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding such that the autotransformer generates a first and second set of auxiliary voltages, each first set of auxiliary voltages having a first auxiliary voltage amplitude and a first auxiliary voltage phase and each second set of auxiliary voltages having a second auxiliary voltage amplitude and a second auxiliary voltage phase, the first and second auxiliary voltage amplitudes ranging between .73 and .78 times the main voltage amplitude, the first auxiliary voltage phase ranging between 35 and 40 degrees leading with respect to the main voltage phase, and the second auxiliary voltage phase ranging between 35 and 40 degrees lagging with respect to the main voltage phase.

27. The method of claim 26, wherein the plurality of primary windings comprises a first primary winding, a second primary winding and a third primary winding, and the plurality of secondary windings comprises a first secondary winding, a second secondary winding, a third secondary winding, a fourth secondary winding, a fifth secondary winding and a sixth secondary winding, and wherein the step of connecting the plurality of primary windings to the secondary windings further comprises:

electrically connecting the first secondary winding to the first primary winding;

magnetically coupling the first secondary winding to the third primary winding;

electrically connecting the second secondary winding to the second primary winding;

magnetically coupling the second secondary winding to the first primary winding;

electrically connecting the third secondary winding to the third primary winding;

magnetically coupling the third secondary winding to the second primary winding;

electrically connecting the fourth secondary winding to the first primary winding;

magnetically coupling the fourth secondary winding to the second primary winding;

electrically connecting the fifth secondary winding to the second primary winding;

magnetically coupling the fifth secondary winding to the third primary winding;

electrically connecting the sixth secondary winding to the third primary winding; and

magnetically coupling the sixth secondary winding to the first primary winding.

28. An autotransformer-based 2n-pulse rectification system having n phases and being powered by a main three phase power source having a main three phase voltage set, each main three phase voltage set having a main voltage amplitude and a main voltage phase, the system comprising:

main rectifier means;

$\left(\frac{n}{3}-1\right)$ auxiliary rectifier means connected to the main rectifier means; and

an autotransformer connected to the main rectifier means and the auxiliary rectifier means, the autotransformer adapted to generate $\left(\frac{n}{3}-1\right)$ auxiliary voltage sets, each auxiliary voltage set having an auxiliary voltage amplitude, k, and an auxiliary voltage phase, α, wherein

$k = \sqrt{4 + 2\sqrt{3}\cos(\theta - \frac{7\pi}{6})}$ and wherein $\alpha = \sin^{-1}(\frac{\sqrt{3}\sin\theta - 0.5}{k})$ assuming a main voltage amplitude of one and a main voltage phase of ninety degrees, wherein $\theta = \frac{180°}{n}$ and its integral multiples for all possible real values of k.

29. The system of claim 28, wherein the autotransformer comprises:

a plurality of primary windings connected in a delta configuration; and

(n-3) secondary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding.

30. The system of claim 28, further comprising a main choke connected between the autotransformer and the main rectifier means and $\left(\frac{n}{3} - 1\right)$ auxiliary chokes connected between the autotransformer and the n auxiliary rectifier means.

31. The system of claim 28, further comprising a choke connected between the power source and the autotransformer.

32. The system of claim 29, wherein the main rectifier means and the $\left(\frac{n}{3} - 1\right)$ auxiliary rectifier means are three phase diode bridges, each having ac input means and dc output means such that the ac input means of the main diode bridge is connected to the main power source via

the primary windings of the autotransformer, and the ac input means of each $\left(\frac{n}{3}-1\right)$ auxiliary diode bridge is connected to the secondary windings of the autotransformer, and the dc output means of the main diode bridge and each $\left(\frac{n}{3}-1\right)$ auxiliary diode bridge are connected in parallel.

33. An autotransformer-based 2n-pulse rectification system having n phases for connection to a load having a load power, comprising:

main rectifier means having a main rectifier power rating, P_{mdb}, wherein $P_{mdb} \geq (\frac{n+3}{2n})$ times the load power;

$\left(\frac{n}{3}-1\right)$ auxiliary rectifier means connected to the main rectifier means and having an auxiliary rectifier power rating, P_{auxdb}, wherein $P_{auxdb} \leq (\frac{3}{2n})$ times the load power; and

an autotransformer connected to the main rectifier means and the auxiliary rectifier means.

34. The system of claim 33, wherein the autotransformer comprises:

a plurality of primary windings connected in a delta configuration; and

a plurality of secondary windings, each of the secondary windings being electrically connected to a primary winding and magnetically coupled to a different primary winding.

35. The system of claim 33, further comprising a main choke connected between the autotransformer and the main rectifier means and $\left(\frac{n}{3}-1\right)$ auxiliary chokes connected between the autotransformer and the $\left(\frac{n}{3}-1\right)$ auxiliary rectifier means.

36. The system of claim 33, further comprising a choke connected between the power source and the autotransformer.

37. The system of claim 34, wherein the main rectifier means and the n auxiliary rectifier means are three phase diode bridges, each having ac input means and dc output means such that the ac input means of the main diode bridge is connected to the main power source via the primary windings of the autotransformer, and the ac input means of each $\left(\frac{n}{3}-1\right)$ auxiliary diode bridge is connected to the secondary windings of the autotransformer, and the dc output means of the main diode bridge and each $\left(\frac{n}{3}-1\right)$ auxiliary diode bridge are connected in parallel.